Chapter 13

Observations with the Meade LX-10 Telescope (Evening Observation)

During this observation period course, you will be using a Meade LX-10 telescope to make observations of celestial objects. You will be using what you have learned about the Meade telescope and planisphere during the afternoon lab (Introduction to the Meade LX-10 Telescopes]Introduction to the Meade LX-10 **8″** Schmidt-Cassegrain Telescope).

13.1 Tonight's Procedure

13.1.1 Getting started

When you arrive on the deck, the telescopes should be set up. Choose a telescope. You will be working in groups of two or three. It may be somewhat crowded due to space constraints so please be careful walking around and try not to hit other person's equipment as they may lose alignment.

First, remove the lens cap from the scope and store it where it will not be stepped on. Next, find the RA and Dec clamps. When they are locked on, the telescope should remain fixed. Do not try and move (slew) the telescope by hand when the clamps are locked. You will damage the gears. If they are unlocked, the telescope should easily move about both axes, but should stay relatively motionless if you stop it and let it go. The balance may not be perfect.

13.1.2 Sighting Polaris

Start with the lowest power (longest focal length—26mm) eyepiece. Place it in the diagonal prism and tighten snugly with the thumbscrew. Point the telescope at about 90° declination and lock the RA clamp. Loosen the Manual Knob slightly and the Dec lock if necessary, and

by rotating the telescope's base and moving the telescope in Declination, center Polaris. The base should rotate very easily. To loosen the Manual Knob, you may have to reach under the tripod base and hold the knob underneath.

If the telescope does not move easily, don't force it; you may damage the gears. The reason is likely due to the Manual knob not being loose enough. You can make fine adjustments in declination by locking the Dec clamp and using the Dec Slow Motion Control Knob. The deck is uneven so do not expect alignment at 90°; this is due to the uneven surface of the observing deck.

Now, sight Polaris through the eyepiece and try to center it as precisely as possible either using the Dec Slow Motion Control Knob or by hand with the Dec clamp unlocked and by rotating the base of the telescope. Through the telescope, Polaris will appear very much brighter than the surrounding stars, and if you look closely you will see a separate very small point of light very close by. Polaris is actually part of a binary star system and what you are seeing is its companion. Once Polaris is centered, tighten the Manual Knob.

13.1.3 Viewing Tips

1. Try not to touch the eyepiece when viewing objects. The vibrations in your hand are immediately transferred to the telescopic image.
2. Allow your eyes to become dark adapted before trying to view faint objects (10-15 minutes).
3. If you wear eyeglasses and are not astigmatic, take them off when using the telescope. The telescope's magnification compensates for near- or far-sightedness; however, a slight re-focusing may be needed.

13.1.4 Stars of Known RA and Dec (Epoch J2000.0)

To use the setting circles you must first line up the RA ring. On any clear night, at least one of these stars should be visible.

Star	*Name*	*RA* (h m s)	*Dec* (deg m s)
α And	Alpheratz	00 08 23	+29 06 27
α Tau	Aldeberan	04 35 55	+16 30 35
α CMa	Sirius	06 45 09	−16 42 47
α Leo	Regulus	10 08 22	+11 58 02
α Boo	Arcturus	14 15 40	+19 11 14
α Lyr	Vega	18 36 56	+38 47 00
α Aql	Altair	19 50 47	+08 52 03

Observation Log

This section should summarize what was observed, how it was observed, and under what conditions. You should include enough information so that you can assess the quality of the observations at a later date, long after you've forgotten what the weather was really like. You should include:

- Date and time of observations
- Location
- Equipment used (eyepieces, filters, *etc.*)
- Outdoor conditions

Make sure you bring several sheets of paper to record the observing conditions and to make sketches of observed objects.

Making Observations

1. Now that your setting circles are aligned, slew the telescope to another star in the list with an RA at least several hours away. Record the RA and Dec as read from the setting circles. This will give you an idea how far off the alignment may be. As you may have noticed, the observing deck is not flat and this may cause problems for some of you.
2. One or more planets may be visible depending on their orbital positions. If any planets are observable, first observe them using the largest focal length lens (this should be the one you have used for alignment—26mm). Center the planet and record its RA and decl. Next, switch to the next smaller focal length lens—15mm. How does the image appear now? Is the image brighter, dimmer, or about the same? Is it larger or smaller? Try the smallest lens, 9.7mm. How does the planet appear now? How hard is it to observe with this lens? What are the pros and cons of the different size lenses?

   If you can't find any planets, try to look at some features of the moon.
3. Depending on what is visible, your TA may ask you to use one or more of the filters in your observations.
4. Look in the 'object book' and try to find some of the double stars, nebulae, and clusters that are visible.

Post-Observation Summary

Telescopes are pretty neat pieces of equipment. I'm sure that some of you have owned (or own) a small telescope as a child. For others, this is the first time you've gotten to use one. We're quite fortunate that we're able to use these tools in an introductory astronomy lab. Not too many schools do that.

As you've heard before, astronomy is an observational science. Without equipment like ground telescopes, radio telescopes, or Hubble space telescopes, we'd really have no way of studying the universe. By learning about telescopes: how they work, how to use them, their limitations, how to improve them, what they do, and what they don't do; we can improve the technology needed to probe deeper into space.

After completing this lab, you should be able to:

- Know how to use the controls on the telescope and use them without damaging the telescope.
- Find a star or planet and align the telescope on it.
- Focus the telescope.
- Explain how to get greater magnification
- Explain how to get greater resolution